

RECOMMENDATION ITU-R M.1470

**METHODOLOGY OF SHARING BETWEEN MSS SYSTEMS (EARTH-TO-SPACE)
AND EXISTING RNSS SYSTEMS (SPACE-TO-EARTH) IN THE FREQUENCY
BANDS 149.9-150.05 MHz AND 399.9-400.05 MHz**

(Question ITU-R 201/8)

(2000)

The ITU Radiocommunication Assembly,

considering

- a) that WRC-97 allocated the band 149.9-150.05 MHz to the MSS on a co-primary basis in the Earth-to-space direction, worldwide, with the radionavigation-satellite service (RNSS);
- b) that WRC-97 allocated the band 399.9-400.05 MHz to the MSS on a co-primary basis in the Earth-to-space direction, worldwide, with the radionavigation-satellite service (RNSS);
- c) that according to RR No. S5.224A, the use of the bands 149.9-150.05 MHz and 399.9-400.05 MHz by the MSS (Earth-to-space) is limited to the LMSS (Earth-to-space) until 1 January 2015;
- d) that an existing RNSS system operates in the bands 149.9-150.05 MHz and 399.9-400.05 MHz in the space-to-Earth direction;
- e) that according to RR No. S5.220, the MSS shall not constrain development and use of the RNSS in the bands 149.9-150.05 MHz and 399.9-400.05 MHz;
- f) that according to RR No. S5.224B, the allocation of the bands 149.9-150.05 MHz and 399.9-400.05 MHz to the RNSS shall be effective until 1 January 2015,

recognizing

- a) that RR No. S4.10 applies to the use of these bands by the RNSS,

further recognizing

- a) that RR No. S4.5 states that “The frequency assigned to a station of a given service shall be separated from the limits of the band allocated to this service in such a way that, taking into account the frequency band assigned to a station, no harmful interference is caused to services to which frequency bands immediately adjoining are allocated”, and that it is necessary to protect the existing RNSS system from harmful interference caused by other services,

recommends

- 1 that the technical information for RNSS and MSS (Earth-to-space) systems, which are planned to work within LMSS (Earth-to-space) in the frequency bands 149.9-150.05 MHz and 399.9-400.05 MHz, outlined in Annex 1 be used as baselines and criteria for the RNSS system protection from LMSS (Earth-to-space) systems;
- 2 that the methodology of Annex 2 could be used for estimating interference to the RNSS system from the LMSS (Earth-to-space) systems;
- 3 that the methods described in Annex 3 be used in developing approaches to facilitate the sharing of the 149.9-150.05 MHz and 399.9-400.05 MHz bands by LMSS (Earth-to-space) and existing radionavigation-satellite systems.

Characteristics of the existing RNSS system to be used in evaluating interference between LMSS (Earth-to-space) and RNSS

1 Description of the TSYKADA space navigation system

The TSYKADA space navigation system consists of three basic segments. They are: space segment, ground control segment and user segment.

1.1 The space segment

The TSYKADA system is made up of seven satellites placed into seven orbital planes with one satellite in each plane. The planes are equally separated by ascending node longitude along the equator. The inclination of the orbits is 83° . The orbital period is 1 h 45 min. The altitude of the orbit is 1 000 km. The orbit is a circular, near-polar one. The transmitting antenna gain is shown in Figs. 1 and 2.

1.2 The ground control segment

The ground control segment consists of the system control centre and ground monitoring station network. All of them are located in the Russian Federation territory.

The monitoring stations are used to measure satellites' orbital parameters and their on-board clock shifts in relation to the system master clock. Those data are relayed to the system control centre. The centre calculates ephemerides of the satellites and data for their clock updating. That information is relayed to the satellites via the monitoring stations every day.

1.3 The user segment

The user segment consists of navigation equipment installed in maritime ships. The user terminal is made up of antenna, receiver, processor and input/output module. A computer included in the user terminal automatically calculates ship position in relation to a satellite and derives the ship coordinates.

The system uses the passive Doppler position fixing method.

Table 1 shows technical characteristics of the RNSS system in the 150 MHz and 400 MHz frequency bands.

1.4 Criteria for protection of the RNSS receiving earth stations

Permitted aggregate maximum pfd produced by the MSS stations at the front end (input) of the RNSS earth station receiving antenna in the 4 kHz bandwidth may be used as a criterion for protection of the RNSS earth stations:

- $-153 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$ in the 149.9-150.05 MHz frequency band;
- $-156 \text{ dB(W/(m}^2 \cdot 4 \text{ kHz))}$ in the 399.9-400.05 MHz frequency band.

FIGURE 1
Transmitting antenna gain for the frequency
150 MHz of the RNSS space station

